Optimum Microarchitectures for Neuromorphic Algorithms

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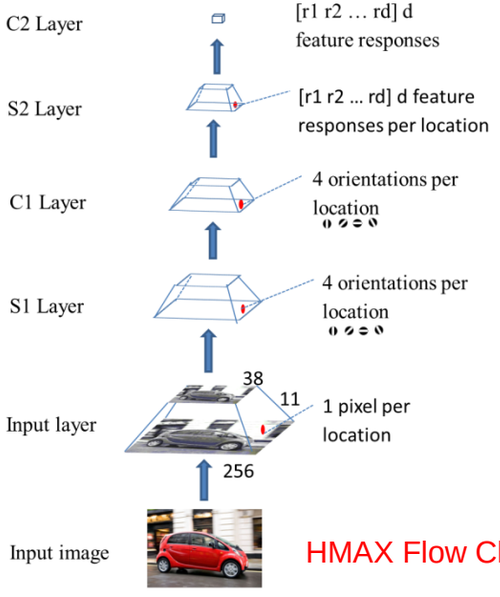
Introduction

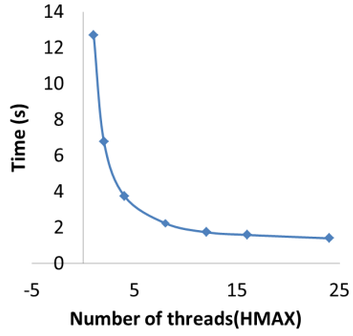
Current computing systems excel at a variety of applications such as scientific simulations. However, they perform poorly at cognitive tasks such as learning, vision, and language. Humans excel at these tasks. There is a strong push currently to design computing systems that perform computations similar to the human brain.

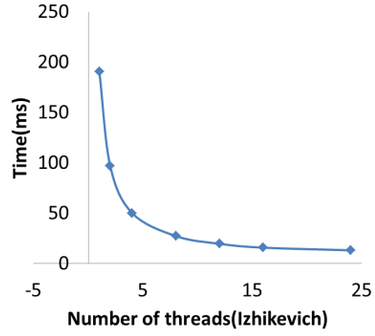
Algorithms and Method

- Two new brain inspired compute algorithm: Izhikevich and HMAX
- Develop and parallelize the HMAX source code to multi-threads process
- Use GEM5 processer simulation software to design a high performance computing system
- A high performance compute cluster: UD Simulation Platform

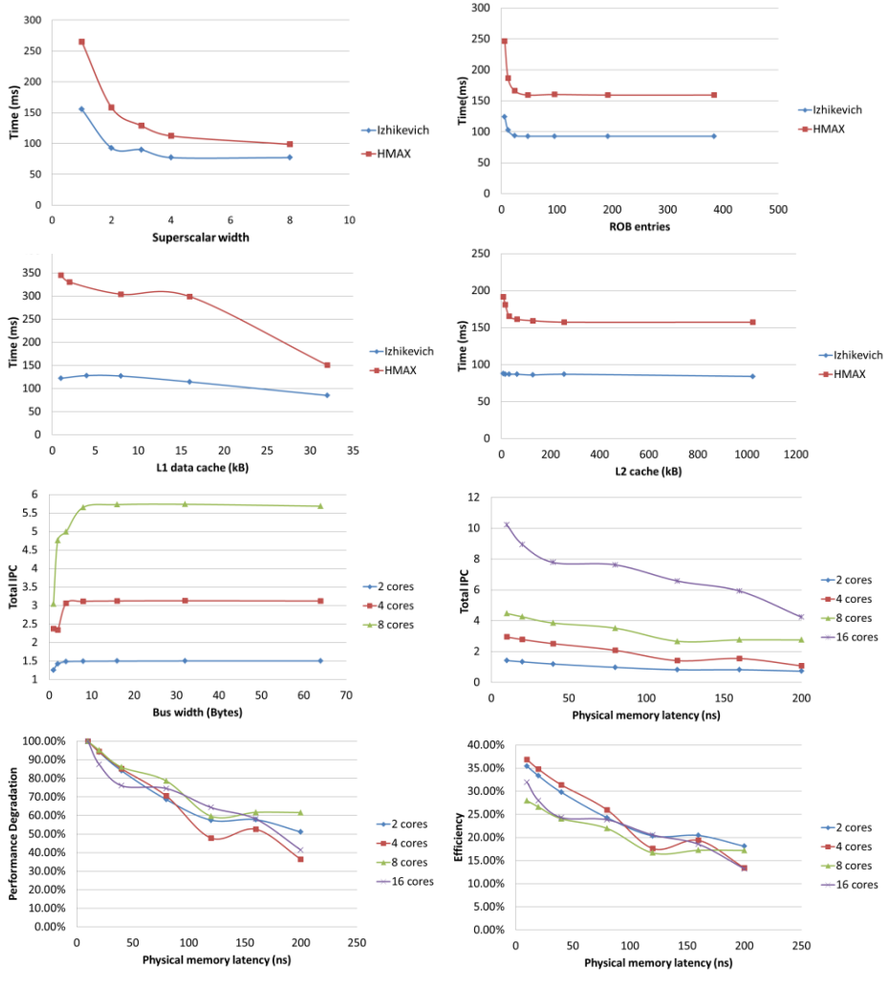


HMAX Flow Chart





Result



Conclusion

- Examined two classes of neuromorphic algorithms.
- Developed parallel implementation of HMAX. Determined single core architecture for each.
- Examined memory bandwidth impact on multicore architecture

Future Work

- Examine the HMAX algorithm with multicore system
- Examine other spiking neuron models
  - --Hodgkin Huxley
  - --Wilson
  - --Morris Lecar
- Examine detailed multicore architecture options

UD Simulation Platform